Mr. D. S. Landis, Assistant Observer, Fort Worth, Tex., under date of February 21, reports that on January 10 the class in physical geography from the Fort Worth High School, accompanied by the science teacher, visited the office, and was shown how the recording instruments work and how maps are made; also by a series of maps the development and progress of cyclones and anticyclones was followed. On January 23 Mr. Landis gave an illustrated talk on the weather, lasting half an hour, to the senior class of the Cleberne, Tex., High School.

Mr. G. A. Loveland, Section Director, Lincoln, Nebr., reports that on January 20 he delivered an address before the meeting of the Nebraska Association of Mutual Insurance Companies on "Electricity in the atmosphere."

Mr. H. W. Richardson, Local Forecaster, Duluth, Minn., reports under date of January 11 that about 25 members of the senior class of the State Normal School, Superior, Wis., visited the office, and were addressed on the subject of weather forecasting and the value of the Weather Bureau.

Mr. W. J. A. Schoppe, Assistant Observer, Iola, Kans., under date of January 29, reports that on the 17th and 18th the class in physical geography, and on the 22d the physics class of the Iola High School visited the Weather Bureau office, where the instruments, the weather map, and the general work of the Bureau were explained to them.

Mr. J. P. Slaughter, Section Director, Oklahoma, Okla., under date of January 7 reports that after moving into new quarters he will confer with the president of Oklahoma University in regard to the advisability of a course of instruction in meteorology.

Mr. J. Warren Smith, Section Director, Columbus, Ohio, under date of February 9, 1906, reports the following educational work done at that station during the month of January, 1906: January 4, regular lectures were begun at the Ohio State University at 4 p. m.; they are to be continued on Tuesdays and Thursdays at the same hour during the winter term of thirteen weeks. January 12, an illustrated lecture was delivered before the Boys' Club of the South Congregational Church at 7:30 p. m. January 25, his Ohio State University class of 40 men visited the Weather Bureau office and were given a lecture upon the instruments and general work. On January 26, 30, and 31 classes in physical geography of about 30 members each, from different city high schools, visited the office and were given a lecture on the instruments and general work of the Bureau.

Mr. P. H. Smyth, Local Forecaster, Cairo, Ill., reports that the class in physical geography of the Cairo High School visited the local office on January 10, 1906, and were given instruction in the use of instruments, preparation of maps, and methods of forecasting.

Mr. James H. Spencer, Observer, Dubuque, Iowa, under date of January 30, reports that on January 23 he gave an illustrated address on the weather map before the Fellowship Club of St. John's Episcopal Church of that city.

Mr. Chas. Stewart, Observer, Spokane, Wash., reports that on December 23, 1905, 20 pupils from Holmes Grammar School, accompanied by their teacher, visited the Weather Bureau office and had the meteorological instruments exhibited and explained to them. Similar visits were made on January 8 and 17, 1906, by parties from the class in physical geography of the Spokane High School.

Mr. W. P. Stewart, Assistant Observer, in charge of the office at Escanaba, Mich., under date of January 21, reports that on the 19th he delivered a lecture on the work of the Weather Bureau before the English Club of that city.

Mr. A. H. Thiessen, Section Director, Raleigh N. C., under date of January 29, reports that on January 25 the class in physics of the Baptist University at Raleigh visited the Weather Bureau office; that he gave them an informal lecture on instruments and the method of forecasting the weather; particular attention was given to the barometer.

Mr. J. R. Weeks, Observer, Binghamton, N. Y., under date of January 27, 1906, reports the delivery of the following lectures: November 16, 1905, at Public Library Lecture Hall, on "The weather in general;" November 17, 1905, at Western Presbyterian Church, to the Men's Club on "The weather;" November 23, 1905, at the Public Library, on "Special types of storms;" December 7, 1905, at the Public Library, on "Climate;" January 8 and 10, 1906, an informal talk to the physiography class of Binghamton High School, in two divisions, on "Instruments and work of the Bureau;" January 11, 1906, at First Presbyterian Church, to the Men's Club, on "Storms and weather forecasting." The formal lectures were all illustrated with stereopticon views.

Mr. Edward L. Wells, Observer, Boise, Idaho, reports that on January 19, the commercial geography class from the City High School, accompanied by their instructor, visited the Weather Bureau office, and that he gave them an informal talk upon the instruments, observations, and the principles underlying forecasting.

Mr. R. F. Young, Section Director, Helena, Mont., reports that he has begun a series of lessons to the physical geography class in the Helena High School. The course of instruction has been planned with special reference to the construction of the weather map and its use in forecasting weather and temperature.

TORNADOES—HAILSTONES—THUNDERCLOUDS.

Under date of June 12, 1905, Dr. J. P. Gibson, of Salisbury, Wake County, N. C., writes as follows:

TORNADO WINDS.

On April 5 last I had occasion to observe a severe tornado that struck this place about 4 p. m. on that day. It came from the southwest and lasted about seven or eight minutes, and the path of destruction was between 200 yards and three-fourths of a mile wide and about six miles in length. On the same evening there was a similar one about 25 miles west, at Mooresville, Iredell County, N. C., at about the same hour. A great many houses were partially and several totally demolished.

What I wish to call your attention to is as follows: There were two auditoriums—one 40 by 200 feet, the other 30 by 80 feet—and a church, 40 by 75 feet, in its path. The larger auditorium collapsed and lay flat on the ground; the end of the building facing the direction from which the storm came was in greater part blown inward and the other walls thrown outward. The large roof was lying flat between the walls on the seats and the ground; the building had no floor but the ground. The smaller auditorium had its roof entirely blown away toward the northwest, the end that fronted the south was blown in, and the other walls bulged outward, but did not fall to the ground. The third building or church utterly collapsed, the greater portion of the roof being blown over a house 35 feet high, across the street, fronted by trees 45 feet high. The tops of the latter were grazed and some of the highest branches torn away. Débris of the roof began to reach the ground about 50 yards away, and shingles were found 600 yards distant. The wall fronting the storm was blown inward and the other walls fell outward; the floor was moved 6 or 8 feet off its supports, which were brick pillars 6 feet in height.

The roof of the large auditorium was nearly intact, but near its southeast end a great hole was torn in it, say twenty feet square, and the piece, which was intact, seemed to have been blown upward, twisted almost completely around, and then dropped back into nearly its original position.

Now in each of these buildings there was a large amount of air inclosed, with no dividing partitions. According to my view the tornado simply took the air pressure off their sides and tops, and in consequence the inclosed air expanded from within and did the greater portion of the damage. It was not the force of the wind outside, but mainly the expansion of the confined air, that wrecked the buildings. Suppose that such public buildings should be so made that a space of, say, ten feet, all around just beneath the roof, could yield to a moderate pressure from within, would not the roof remain intact and the walls remain vertical?

HAILSTONES.

A few days ago I examined some hailstones under a small-power microscope. It has been said that hailstones all have a snowball for a nucleus. I think that this is a mistake. The white central sphere of the hailstone, inclosed in its rim of crystal, glassy ice, is simply normal ice. Put some water in a drachm vial and freeze it in a tumblerful of freezing mixture, consisting of two parts by weight of ice to one of salt, hold it up to the light, and you will find a central core of white amorphous ice, with crystalline ice enveloping it on all sides. There is no snowball to start with in this instance; the freezing always begins on the top, bottom, and sides, and the liquid center freezes last. I fully believe the hailstone is first a spherical drop of water; then its outermost rim reaches 32° F. in the surrounding cold, congeals, and the congelation gradually extends inward till the last of the liquid content becomes solid. Water can not be frozen in a tube or in any sort of way so that it will not be white in the center if the cold strikes it on all sides. Boil water, pour castor oil on it before it has a chance to reabsorb the three per cent of air that naturally belongs to it, freeze it, and you get amorphous ice (never crystalline), looking like paraffine. The central core is larger in the hailstone, in proportion, than it would be in a piece of ice of the same diameter frozen naturally in a tube or other vessel. This is because hail forms four to eight miles above the ground and there is less air in the water at that height than at the ground, where the pressure is 30 inches.

I think that large hailstones are simply aggregations and clusters of hail. Melt the top of a block of ice so that it is covered with moisture, cover it with another block of ice, and the two will unite solidly, even when the temperature outside is above 32° and the outsides of both blocks are in a melting state.

THUNDERCLOUDS.

A thundercloud is composed of fog particles, these particles being much smaller, according to the laws of gravity, at the top than at the broad black base. It seems to me that meteorologists generally teach that it is the condensation and coalescence of these particles that form raindrops, and that this coalescence takes place by the action of cold, and that it begins when the dew-point is reached. This is true in regard to fog particles only, and fog particles have still further to be condensed before they lose their spherical shape, and this requires a much greater degree of cold than any one seems to have thought necessary so far as I can learn. Mists above rivers or fogs on the coast are seen when the temperature is far below freezing. In other words, fog particles will not coalesce at temperatures below freezing.

We will suppose the peak of a thundercloud to reach eight and one-half miles. That height on a summer day has a temperature of at least —50° F., and yet you see before you a mass of vapor, boiling and seething, just as steam from an engine does on a cold morning. Heat from below is continually being supplied, and however cold the interior of the cloud may be, it is evidently not sufficiently so to consolidate the vapor. The very moment, however, that the vapor reaches the top edge of the cloud and encounters —50° F. of cold, each spherical fog or cloud particle is so constricted upon its inclosed, now much rarefied, air particle that the latter forces its way out just like the bursting of a soap bubble, and now instead of a film of water surrounding a globule of air you will have left a tiny mass of genuine, unadulterated water. This has appreciable weight, falls downward, rupturing by contact in its descent countless ascending fog particles, coalescing with them, and by the time the base of the cloud is reached a large drop of rain has been formed. Thus rain begins at the very top layer of the mass of fog particles and nowhere else. The higher the cloud, and the greater the number of fog particles encountered in the descent, the harder the rain. Every thundercloud shows the rain streak directly below the peak. A flash of lightning or peel of thunder is never noticed till those rain streaks appear below.

We print the above as coming from a close observer and logical reasoner, but doubtless others will differ from him as to facts and theories. The formation of hail and rain is not yet well understood. We hope that others will contribute to this subject; observations, theories, and experiments by careful physicists are much to be desired.—EDITOR.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

North Atlantic weather was not notably severe. Barometric pressure continued low over the British coasts. After the 4th high barometric pressure and settled weather prevailed over the Azores.

Ten areas of low barometer moved eastward over or near the Canadian Maritime Provinces, one of which advanced from the Gulf of Mexico, one from the subtropical region north of Cuba, and one from the north Pacific coast of the United States; the remaining low areas first appeared over the interior of the North American Continent.

Over the greater portion of the United States the month was exceptionally mild, and in parts of the Missouri and Red River of the North valleys the mean temperature for the month was 10° to 12° above the normal. Precipitation was irregularly distributed, and there was a general deficiency in snowfall.

In the Atlantic coast States the barometric depressions were of moderate intensity. Several energetic storms crossed the Great Lakes, those of the 3d–4th, 5–6th, and 14–15th being the most severe. The principal storms of the Pacific States occurred during the second decade of the month.

Attending low area I heavy snow fell in New Mexico on the 1st, and heavy rain in the lower Mississippi Valley on the 2d. On the 3d the barometer fell to 28.68 inches at Madison, Wis., at 8 p. m., snow fell in Iowa, Minnesota, Wisconsin, and Upper Michigan, heavy rain generally east of the Mississippi, and a strong gale prevailed over the upper Lakes. A tornado is reported as having visited Albany, Ga., at 2:30 p. m. Snow continued in the Lake region during the 4th. In connection with low area II high winds prevailed from the Great Lakes over the middle Atlantic and New England coasts. During the passage of low area III snow fell in the Ohio Valley and the Atlantic States to and including North Carolina on the 8th.

From the 12th to 14th low area IV moved northeastward off the Atlantic coast with gales that attained a reported maximum velocity of 67 miles an hour from the northeast at Nantucket, Mass., on the 14th. From the 11th to 13th low area VI caused heavy rain and high winds, on the Pacific coast. During the 15th and 16th low area VII passed northeastward over the Lake region, with rain from the lower Mississippi Valley over the Ohio Valley and Great Lakes. From the 16th to 18th low area VIII crossed the continent from the north Pacific coast to the Canadian Maritime Provinces. On the 22d heavy rain fell in the lower Mississippi Valley, and rain, sleet, and snow in the middle and upper Mississippi valleys, and on the 22d heavy rain was general from the Ohio Valley over the middle and east Gulf States, and snow fell over the upper Lakes. On the 26th heavy precipitation attended the passage of low area XI northeastward off the Atlantic coast, and snow was reported in the interior of South Carolina and Georgia.

The first and most important cold wave of January advanced over the interior and eastern parts of the country from the 19th to 24th, breaking a period of exceptionally high temperature that had continued generally east of the Rocky Mountains from the beginning of the month. During the 30th and 31st a moderate cold wave advanced from Manitoba over the Red River of the North and the upper Mississippi valleys.

Heavy frost occurred on the middle coast of the Gulf of Mexico on the 1st, 9th, 14th, 23d, and 24th, and on the Texas coast on the 24th and 25th. Freezing temperatures were reported at New Orleans, Mobile, and Pensacola on the 9th, 23d,